

Heracast EC



GB Operating instructions
Heracast EC

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2 Instructions on using the unit safely

2.1 Explanation of Symbols

Symbol	Accompanying word(s)	Explanation
	CAUTION	Safety-relevant paragraphs and sections in these working instructions have been marked with this symbol.
	NOTE	Information within the working instructions on the optimum use of the unit.
	HOT SURFACE	Hot surface. Risk of getting burned.
	HIGH FREQUENCY	Caution high frequency. Not to be used by persons with pacemakers.
	WARNING	Warning: Caution High frequency.
	DISCONNECT FROM MAINS	Danger of electric shock when unit is opened. Unplug the unit before opening it.
	CHANGE	Important: Changes have been made to this paragraph. Please read carefully.
		Registration certificate according to the ministry of health of the Russian federation.

2.2 Transport damage

Please check the unit for transport damage and, if necessary, report the damage to the forwarder within 24 hours after receiving the unit.

Under no circumstances, work with a damaged machine.

2.3 Operator’s obligations

In addition to complying with the statutory regulations specified by the manufacturer, the operator must ensure the statutory obligations are observed and implemented at the working place, i.e. he must train his personnel and comply with industrial safety legislation and any other regulations or laws in force.

For working at and with the machine, the operator must draw up written instructions in understandable form and give these to his employees in their own language. These instructions must be based on the operating manual and written in light of the work to be performed.

2.4 Unit book

We recommend you keep a unit book. All tests as well as all essential works (e.g. repair work, modifications) must be documented in this book.

2.5 Safety information

With these laboratory units the safety concerning the protection of persons, the environment and the material to be processed mainly depends on the behavior of the persons operating the unit.

Prior to operation read the working instructions carefully, adhere to the information provided in order to avoid errors and damage, in particular damage to the health.

In addition to the information in these working instructions, relevant national laws and guidelines must be observed for setting up and operating this unit (technical connection requirements of the electrical supply companies, etc.).

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HIGH FREQUENCY

Not to be used by persons with pacemakers Read working instructions prior to use! We cannot accept any guarantee claims or assume liability if the machine is used for other purposes as stated or for damage resulting from non-compliance with these working instructions!



HOT SURFACE

The metal surface around the casting chamber heats up during continuous operation.
Do not touch this surface.

When casting and in particular when handling melted metal face guards, gloves and aprons must be worn.
Cleaning must always be carried out when the unit is cool.



WARNING

This symbol warns of the dangers of electric voltage. In the case of non-compliance the result of an electrical shock with all known effects can be death. When inspecting the housing cover this safety symbol is visible on the free surface on the operating unit. Please observe the safety instructions when carrying out servicing.

Works at the electrical equipment of the unit must only be performed by the authorised Heraeus service and in the safe condition (voltage cleared).



CAUTION

Power cable and plug must be checked for damage prior to operation.
If any damage exists, the unit must not be connected to the mains.
A damaged mains connecting cable may only be replaced by a mains connecting cable of the same type.
3 x 1.0 mm², H05RR-F, black, 155 °C, central plug, straight / power connector.



NOTE

Due to the waste gases released during working, adequate ventilation must be provided.

Works at the electrical equipment of the unit may only be performed by **adequately trained service companies** and in the safe condition (voltage cleared).

Only permissible original spare parts must be used. The use of different parts holds unknown risks and must be avoided at any rate.

Proper function and safety of the unit are only guaranteed if the required tests, maintenance and repair work have been performed by Heraeus Kulzer service agents or by **personnel adequately trained** by the manufacturer.

Heraeus Kulzer will **not accept** any liability for damage to the unit resulting from inexpert repair which has not been performed by **Heraeus service agents** or if no original spare parts / accessory parts have been used during the exchange of these parts.

3 Use in accordance with specifications

The induction casting machine Heracast EC is a laboratory unit for casting all precious metal and almost all non-precious and CoCr partial denture alloys for dental applications with a liquidus temperature of 500 °C up to > 1600 °C.

The unit is not suitable or intended for casting pure titanium or beryllium-containing alloys!



CAUTION

Processing of beryllium-containing alloys is hazardous to health!

Casting of these alloys is performed at the user's risk! Heraeus Kulzer GmbH will not accept any liability for any health damage that may have been caused by casting such alloys!

Casting of titanium- or aluminium-containing alloys is performed in special working steps.
See paragraph 10.4 Titanium and aluminium-containing alloys.

Precision castings with alloy quantities of up to 130 g in the graphite crucible and 100 g in the ceramic crucible are possible.
Alloy quantity for CoCr partial denture and non-precious metal bonding alloys in the ceramic crucible: up to 60 g.



NOTE

We recommend the exclusive use of original Heraeus Kulzer crucibles which are especially made for this type of application. The use of other materials voids guarantee claims in case of damage to the unit or the molten material.
Due to various possible causes for bad castings results, we do not grant any guarantee for such cases.

3.1 Working rules



CAUTION

- Personal protective equipment such as hand, face and body protection must be worn; jewellery must be taken off prior to working.
- Normally, the unit is suitable to be set up and operated in the following fields: Commercial and industrial laboratories, schools, universities, hospitals, etc. The unit has been designed for continuous operation.
- The pressure control is technically set to 3.5 bar on the unit and by means of a safety valve set to a pressure of 3.7 bar.



CAUTION

Do not use the unit for the following activities:

- The unit must not be used for melting and casting beryllium-containing alloys (hazardous to health!).
- Do not use the unit for melting, drying or thermal treatment which may lead to the release of combustible gases and vapours which burn with air or which may form a hazardous, injurious or explosive mixture.
- The unit is not suitable for thermal treatment of hazardous or health-hazardous materials (e.g. dusts, fibres, liquids, solids).
- The unit must not be used to heat up food.

4 Scope of delivery / consumables set

Check that all components are in perfect condition on delivery of the machine.
If you wish to make a complaint, contact your supplier.

4.1 Scope of delivery

- 1 x Heracast EC, Operating instruction, test certificate
 - 1 x Key for casting ring holder
 - 1 x Pressure hose 13 mm, incl. 2 hose clamps and a socket 13 mm
 - 2 x Door signs
- Caution! High frequency. "Not to be used by persons with pacemakers"**



HIGH FREQUENCY

Attach the supplied adhesive symbols "Not to be used by persons with pacemakers" to all entrances to the unit service room.

4.2 Accessories not included in the scope of delivery

Vacuum pump: CL-P Typ 7, 230 Volt, 50 / 60 Hz Order-No. 66002450

4.3 Original equipment Set

- 1 x Small alloy spoon
- 1 x Box cont. small melting powder pellets
- 1 x Acrylic sprue canal aid
- 1 pack 6 pcs ceramic crucibles for CL-IG / IM / I95 / Heracast iQ / EC
- 1 pack 6 pcs ceramic crucibles NPM-crucibles for CL-IG / IM / I95 / Heracast iQ / EC
- 1 x Crucible box CL-IG / IM / I95 / Heracast iQ / EC
- 1 pack 10 pcs graphite inserts for CL-IG / IM / I95 / Heracast iQ / EC
- 3 x each Casting ring (X3, X6, X9)
- 1 x each Cone former (X3, X6, X9)

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5 Structure and function

5.1 Control and display elements



- 1 Viewing glass – casting chamber
- 2 Graphic display with control elements
- 3 Locking lever – casting chamber
- 4 Filter cover – air supply

5.2 Partial view open chamber



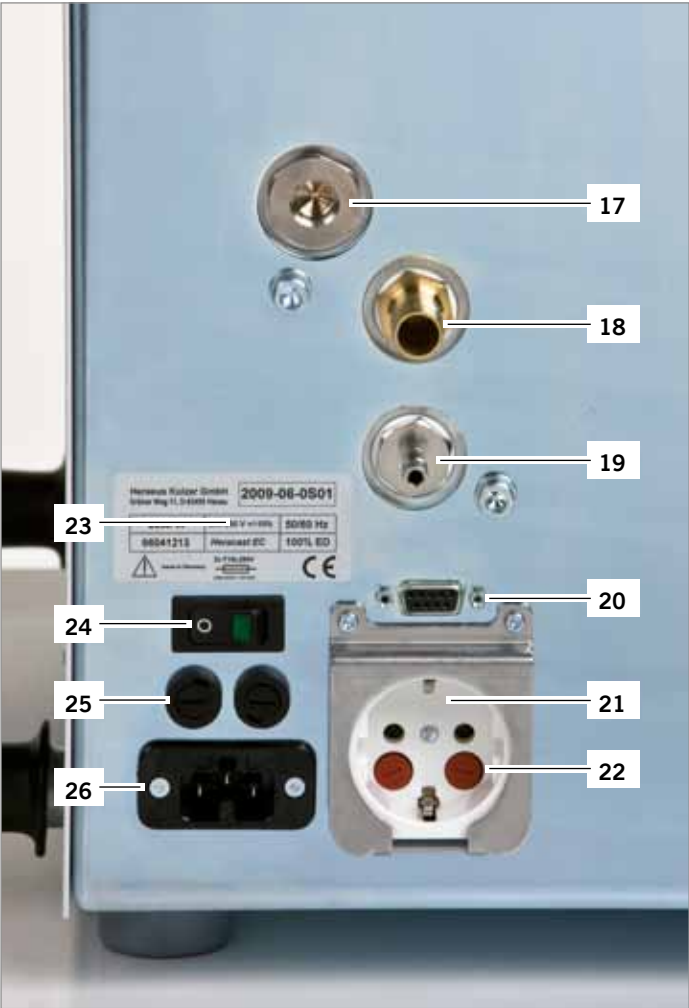
- 5 Viewing glass – casting chamber
- 6 Ceramic crucible
- 7 Shielding plate
- 8 Adjustable casting ring holder
- 9 Locking lever – casting chamber
- 10 Collecting plate
- 11 Screw for adjustable casting ring holder
- 12 Clamping device for casting ring
- 13 Interactive buttons
- 14 Turnable push-knob

5.3 Partial view cooling water



- 15 Side trap door with viewing glass for cooling water level
- 16 Carrying handle

5.4 Partial view inlet and power connections



- 17 Compressed air prefilter for pilot valves (for service only)
- 18 Compressed air supply
- 19 Vacuum connection
- 20 Interface RS232 (for service only)
- 21 Mains connection for vacuum pump
- 22 Fuses for vacuum pump (T 6.3A)
- 23 Type plate
- 24 Power switch
- 25 Unit fuse (T 16A)
- 26 Mains connection

6 Location and installation

6.1 Transport

Carefully transport the unit horizontally to prevent the pump oil from leaking and damaging the unit. Packings and units must not be stacked. Shocks must be avoided! If there is a risk of frost during the transportation of the unit, the cooling water must be removed from the unit. Please notify the service technicians.

For dimensions and weight refer to paragraph 12 Technical data.

6.2 Unpacking

Remove straps. If required, screw in the carrying handles at the corners of the unit.

6.3 Set-up

Location: Table with load bearing capacity of at least 70 kg.
Table area (w x d): 650 x 550 mm.

The casting machine must be placed on a solid, skid-proof surface (laboratory desks, racks) so that a horizontal safe position is ensured. The room temperature should not be more than 40 °C.

Air inlet and outlet openings in the housing of the unit (rear and lower surface) must not be covered or blocked.
Minimum distance to the wall: 100 mm.



CAUTION
Following instructions must be strictly followed:

- The rear side of the unit must be at least 100 mm away from the wall to avoid blocking the air outlet of the built-in fan.
- There must be no combustible materials, e.g. newspapers and similar, present near the casting machine and in particular near the casting chamber and under the unit.
- To transport the unit do not lift the unit at the chamber! Risk of damaging the unit!
- Risk of damage and injury in case of non-compliance!



NOTE
This unit may emit high-frequency energy and cause interference with radio communication.

Should this unit cause interference with radio or television reception, it is recommended for users to eliminate interference with one or several of the following measures:

- Adjusting or changing the position of the antenna(s).
- Enlarging the distance to the receiver.
- Connecting the unit to a circuit separated from the circuit of the receiver.

6.4 Mains connection

Mains: 200 – 230 V (AC), 1 P / N / PE, 50 / 60 Hz, connect to mains in accordance with VDE specifications and local power supply specifications with flexible mains connecting cable with hot appliance plug and safety plug to a correctly installed socket with safety contacts (protection class 1).

Mains fuse: Separate safety fuse 16 A inert or safety cut-out fuse C 16 A.

Mains connection: The unit should not be connected via a connection fault current circuit breaker. If the use of a fault current circuit breaker is specified by the local electricity board, type 30 mA should be used.

6.5 Compressed air supply



NOTE
The compressed air must be clean and dry!

- Air pressure min. 4 bar, max. 7 bar! Higher air pressure (even short-term) can result in damage to the inner valves! To avoid this, an optional pressure reducer filter combination must be used. Order No. 66005499.
- In case of moist compressed air, this pressure reducer/ filter combination or water separator / filter must also be connected in series. The pressure reducer includes accessories for unit mounting or wall mounting.
- Line cross-section (inner) min. 10 mm.
- Rapid pressurization (< 1.5 sec.) is essential for the mould filling behaviour. Non-compliance can result in faulty castings. The use of a separate compressed air tank (< 10 mm) in the direct vicinity of the casting machine is recommended for small line cross-sections. Order No. 66008921.



NOTE
Any guarantee claims shall be excluded in case of malfunctions or damage resulting from inadequate compressed air supply!

6.6 Vacuum air connection



CAUTION
Prior to operating, check whether the nominal voltage corresponds to the value indicated on the type plate of the vacuum pump.

Attach the hose of the vacuum pump to the connection of the casting machine. Connect vacuum pump to the socket (rear of the unit). The power cord must not touch the casting chamber. (Follow to the working instructions of the vacuum pump!).

6.7 Filling the cooling system

For safety reasons the inner cooling system is only prefilled with a small quantity of antifreeze and anticorrosion agent. To fill the system completely, open the side trap door and fill the container with tap water (do not use distilled water). If the water level has reached the value “MAX.”, stop filling.



CAUTION
Do not fill over the “MAX.” marking. Risk of damaging!
After initial operation, the cooling water level must be checked again and the unit must be filled up with pure tap water.



WARNING
Risk of electric shock when unit is opened. Unplug the unit, before opening the side flap.

6.8 Room ventilation

The room in which the unit is operated must have sufficient technical ventilation. The unit must not be operated in recesses that cannot be ventilated. If several units are to be placed in one room, special ventilation measures may be required (e.g. zone ventilation).

7 Operations

The following pages are to provide basic information and hints which are essential for successful and error-free working. Please observe the order of the working steps. Mostly, casting errors cannot be attributed to the casting machine.

7.1 Putting into operation

When the machine is switched on the request “Please open and close the chamber” appears as animated icon after welcome display. If the chamber was closed it must be opened and then closed again. The safety test cycle starts after correctly switching of door limit switches.

Welcome



Safety test



Main menu



The vacuum pump evacuates the chamber. Then the induction coil and the casting ring are turned automatically and pressurization is started. Prior to turning back the induction coil and the casting ring to the basic position the chamber is deaerated automatically.

In case of a defect or an error, a respective message is displayed. Once the test run has been successfully completed, the machine is ready for operation.



CAUTION
If an error cannot be eliminated, please contact the responsible service agent. The addresses can be found on the paragraph 15 Service of these instructions. Unauthorized opening of the machine include unknown risks and are not permissible.

7.2 Putting out of operation

- Remove crucible and casting ring from the chamber.
- Let the unit cool down for approx. 3 minutes before switching it off.
- Switch off the unit; unplug the unit if it is not to be operated for longer periods.
- Remove contamination from the crucible, fielding plate and the chamber.

7.3 Errors and causes

If a malfunction occurs during test run or when operating the unit, the malfunction is shown on the display. There are various warnings (W) and error messages (E).

Warnings are indicated on the display by an “ATTENTION” icon (see paragraph 8.1.1 Icons in the status display); the process is continued. If an error occurs, the process is terminated immediately and the error screen of the information menu is activated. The current error is inverted (see paragraph 8.5 Error history).

The following warning messages may be displayed:

Code	Message		Condition	Time delay	Possible cause
	Assembly Group	Component			
W2	Cooling	Waterflow too low	< 800 ml	4 sec.	<ul style="list-style-type: none">● Blocked drains at:<ul style="list-style-type: none">– Cooler– Oscillator● Defect at:<ul style="list-style-type: none">– Water tube– Water pump– Flow meter
W3	PWR Supply	PWR-Temp. > 75 °C	> 75 °C	1 sec.	<ul style="list-style-type: none">● Switching power supply too warm
WC	Cooling	OSC-Temp. > 65 °C	> 65 °C	1 sec.	<ul style="list-style-type: none">● Oscillator temperature (outlet) too high. Allow to cool down
WD	Cooling	OSC-Temp. < 10 °C	< 10 °C	1 sec.	<ul style="list-style-type: none">● Oscillator temperature (outlet) too low
WE	Cooling	WTR-Temp. > 55 °C	> 55 °C	1 sec.	<ul style="list-style-type: none">● Cooling liquid-temperature (inlet) too high. Allow to cool down
WF	Cooling	WTR-Temp. < 10 °C	< 10 °C	1 sec.	<ul style="list-style-type: none">● Cooling liquid-temperature (inlet) too low
WG	Cooling	AIR-Temp. > 50 °C	> 50 °C	1 sec.	<ul style="list-style-type: none">● Inside temperature too high
WH	Cooling	AIR-Temp. < 10 °C	< 10 °C	1 sec.	<ul style="list-style-type: none">● Inside temperature too low
WL	Induction	Check crucible	Deviation of SET / ACTUAL power in the graphite crucible > 5 %	4 sec.	<ul style="list-style-type: none">● Graphite crucible: If weight < 7g, replace graphite crucible● Defect at:<ul style="list-style-type: none">– Inductor
WM	Vacuum	Vac. not reached	> 500 mbar.	15 sec.	<ul style="list-style-type: none">● Check pressure air supply● Check vacuum pump● Check chamber sealing for air leakage
WO	Pressure	Pressure too low	< 2.9 bar	4 sec.	<ul style="list-style-type: none">● Check pressure air supply
WP	Pressure	build-up time > 2 sec.	> 2 sec.	4 sec.	<ul style="list-style-type: none">● Pressure build-up too slow. Check compressed air supply
WR	Pressure	Pressure too high	> 3.5 bar	4 sec.	<ul style="list-style-type: none">● The warning may occur, if large casting moulds are used

The following error messages may be displayed:

Code	Message		Condition	Time delay	Possible cause
	Assembly Group	Component			
E1	VAC-Sensor	check pressure sensor	If ambient pressure of < 600 or > 1200 mbar measured	2 sec.	<ul style="list-style-type: none">● Check pressure sensor● Cable break
E2	Cooling	Waterflow too low	< 600 ml	4 sec.	<ul style="list-style-type: none">● Blocked drains at:<ul style="list-style-type: none">– Cooler– Oscillator● Defect at:<ul style="list-style-type: none">– Water tube– Water pump– Flow meter
E3	PWR Supply	PWR-Temp. > 100 °C	> 100 °C	1 sec.	<ul style="list-style-type: none">● Switching power supply too hot

The following error messages may be displayed:

Code	Message		Condition	Time delay	Possible cause
	Assembly Group	Component			
E4	TMP-Sensor	WTR-Temp.-Sensor	Short circuit or broken wire	2 sec.	● NTC sensor defect (inlet)
E5	TMP-Sensor	OSC-Temp.-Sensor	Short circuit or broken wire	2 sec.	● NTC sensor defect (outlet)
E6	TMP-Sensor	AIR-Temp.-Sensor	Short circuit or broken wire	2 sec.	● Sensor defect
E7	Switches	Chamber position	NO / NC contact not antivalent	1 sec.	● Check limit switch for chamber position; readjust if necessary ● Broken wire
E8	Switches	Chamber lock OPEN	NO / NC contact not antivalent	1 sec.	● Check limit switch for chamber lock position “OPEN”, if necessary readjust ● Broken wire
E9	Switches	Chamber lock CLOSED	NO / NC contact not antivalent	1 sec.	● Check limit switch for chamber lock position “CLOSED”, if necessary readjust ● Broken wire
EC	Cooling	OSC-Temp. > 70 °C	> 70 °C	1 sec.	● Oscillator temperature (outlet) too high. Allow to cool down ● If message is still displayed after 10 min. cooling: – Short circuit at NTC sensor (outlet)
ED	Cooling	OSC-Temp. < 5 °C	< 5 °C	1 sec.	● Oscillator temperature (outlet) too low ● Broken wire at NTC Sensor (outlet)
EE	Cooling	WTR-Temp. > 60 °C	> 60 °C	1 sec.	● Cooling liquid-temperature (inlet) too high. Allow to cool down ● If message is still displayed after 10 min. cooling: – Short circuit at NTC sensor (inlet)
EF	Cooling	WTR-Temp. < 5 °C	< 5 °C	1 sec.	● Cooling liquid-temperature (inlet) too low ● Broken wire at NTC Sensor (inlet)
EG	Cooling	AIR-Temp. > 60 °C	> 60 °C	1 sec.	● Inside air temperature too high
EH	Cooling	AIR-Temp. < 5 °C	< 5 °C	1 sec.	● Inside air temperature too low
EI	Induction	PDC > 1900 W	> 1900 W	1 sec.	● Generator power output too high
EJ	Induction	Energy control	After 300 kW/s	–	● Induction automatic cut-off. This is not an error but a protective measure!
EK	PWR Supply	I/O reading error	–	1 sec.	● Received no acknowledgement from switching power supply
EM	Vacuum	Vac. not reached	> 500 mbar > 100 mbar	25 sec. 45 sec.	● Check pressure air supply ● Check vacuum pump ● Check chamber sealing for air leakage
EN	Leakage	Vacuum / pressure	During Self test: Pressure rise in the vacuum > 30 mbar or pressure drop when pressure > 300 mbar	4 sec.	● Check chamber sealing / valve block for air leakage
EO	Pressure	Pressure too low	< 2.7 bar	4 sec.	● Check pressure air supply
EQ	Pressure	Release time > 6 sec.	> 0.2 bar	6 sec.	● Check air release filter at valve block
ER	Pressure	Pressure too high	> 3.7 bar	4 sec.	● Check valve block / pressure sensor
ES	Movement	Check POTI	Short-circuit	–	● Position sensor defective
ET	Movement	POTI-movement	No change at U _{Poti}	1 sec.	● Turning motor not activated: – Check position sensor – Check turning motor
EU	Movement	Basic position	+/- 15 digits	3 sec.	● Basis position not reached
EV	Movement	Casting position	+/- 15 digits	3 sec.	● Casting position is not reached
EW	Locking	Rotation to OPEN	Limit switch for locking “OPEN” not achieved	3 sec.	● No rotation of motor ● Cable breakage ● Check limit switch for locking position “OPEN”, adjust if required
EX	Locking	Rotation to LOCK	Limit switch for locking “LOCK” not achieved	3 sec.	● No rotation of motor ● Cable breakage ● Check limit switch for locking position “LOCK”, adjust if required

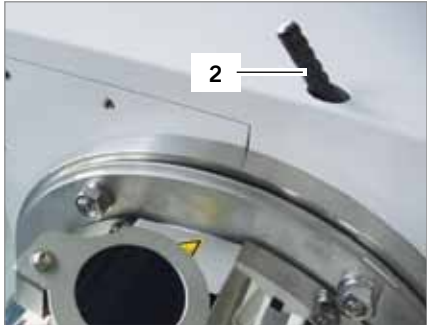
7.4 Manual unlocking of casting chamber

In the event of a bad casting result or excessive contamination of the casting chamber, the chamber locking mechanism may be jammed or blocked in the worst case. Afterwards, automatic unlocking of the chamber locking mechanism is no longer possible. Manual unlocking will support the automatic process.

Step 1. Preparation

Please switch off the device.
Remove the sealing cap (1) and insert the steel stick included in the scope of delivery (2) into the guide as shown in the photos on the right).

Make sure to use a hammer and apply gentle blows to the steel stick to support the automatic chamber locking mechanism.



GB

Step 2. Manual unlocking

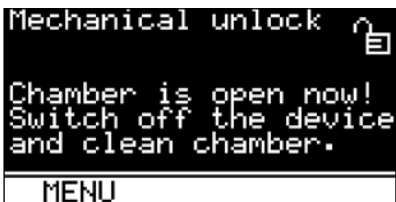
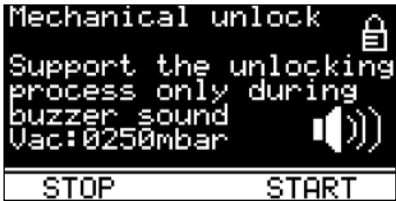
Please switch on the device. Press the left key while the welcome screen is displayed. The mechanical unlock program is loaded.

Start manual unlocking by pressing the right “START” key. The vacuum pump is automatically activated and creates a vacuum inside the chamber.
From a vacuum level of 250 mbar, an acoustic signal is heard and the speaker icon is animated. As long as the signal is heard, you may apply gentle blows to the steel stick to support automatic unlocking of the chamber.

As soon as the chamber is opened, the acoustic signal is stopped and the manual unlocking process is completed. Follow the instructions shown on the display, switch off the device and clean the casting chamber.

If the lock cannot be opened during the first cycle (8 seconds), the procedure can be repeated as often as desired.

Please inform your responsible regional Heraeus Kulzer service partner if the chamber locking mechanism does not unlock after repeated attempts.



NOTE

Always attempt to unlock manually without the support of the automatic chamber unlocking mechanism.



ATTENTION

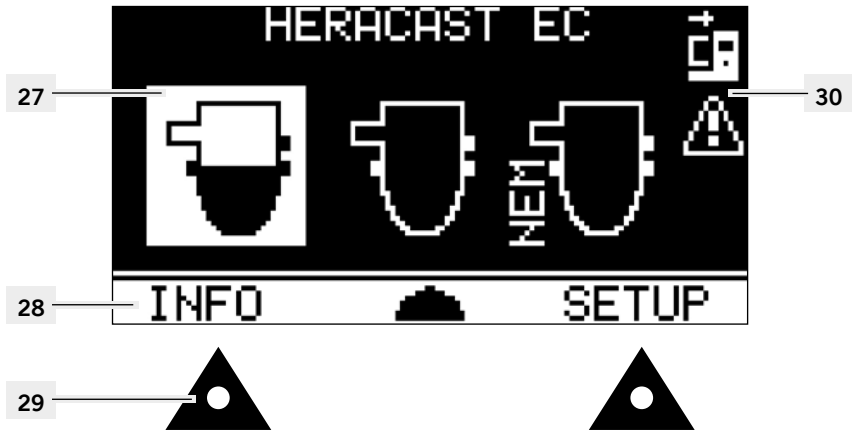
The acoustic signal can be heard for approx. 8 seconds. The automatic chamber unlocking mechanism should only be supported during this period. Failure to follow these instructions may lead to damage to the locking motor.

8 Working with Heracast EC

After switching on and successful completion of the Auto-Test, the user is automatically directed to the main menu. In this menu additional options are available.

8.1 Controls for operating

The Heracast EC is operated using two buttons and a turning knob with noticeable pressure point. The functions of the buttons vary depending on the active menu and device status.



- 27 Choices (display of the selected item is inverted)
- 28 Variable menu bar; options can be selected using the push button
- 29 Push button for menu bar
- 30 Status displays

8.1.1 Icons in the status display



Chamber open
Indicates that the casting chamber is open.



Chamber locked
Indicates that the casting chamber is closed and locked.



Chamber unlocked
Indicates that the casting chamber is closed but not yet locked.



Message
Indicates that a warning or error message occurred.



MAINTENANCE icon After 3000 castings!
Please contact the Heraeus Kulzer Service.



MAINTENANCE icon After 10,000 castings!
Maintenance of safety-relevant components. Please contact the Heraeus Kulzer Service.

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8.2 Casting Menu

The main menu includes the following options, which you can select using the turning knob:

- Ceramic crucible with graphite insert (for gold casting or high-gold content ceramic bonding alloy).
- Ceramic crucible (for Pd-based alloys or gold Pd alloys).
- NPM crucible (for NPM or CoCr frameworks).

Push the turning knob to confirm the selection.

In the Enter Vacuum menu you can accept the default value or specify a different value by turning the turning knob. The currently specified vacuum value is also indicated in the graphic vacuum indicator.

Push the “**BACK**” button to return to the previous menu.

Push the turning knob to confirm the specified vacuum value.

The Casting menu displays the entire casting process. In the upper left corner the current vacuum value [mbar] or pressure value [bar] is displayed with the pressurization time in seconds; a timer [mm:ss] is displayed on the right. The timer starts automatically with induction and can be reset to 00:00 by pressing the turning knob.

In the lower part of the Casting menu the currently specified power value is displayed as percentage in large numbers. You can change the default value anytime by turning the turning knob to the left or to the right.

Now close the chamber and start the melting process by pushing the key under the “**START**” menu item. The chamber will automatically be locked and the specified target vacuum will be built up. Induction starts automatically from a vacuum value of 450 mbar upwards.

Any power adjustments during melting must always be performed manually.

Push the “**STOP**” key when premelt is completed.

Push the “**CAST**” key to pivot the inductor coil and the casting ring immediately. Due to its own weight the melt will flow into the cavities of the casting mould. Simultaneously, compressed air is admitted to the chamber automatically (audible pressure surge) and the melt is pressed into the finest areas of the casting mould.

After the alloy has solidified (approx. 60 seconds after pivoting), the inductor coil and the casting ring pivots back automatically and the chamber unlocks. The casting process is completed. Open the chamber and carefully take out the casting ring.

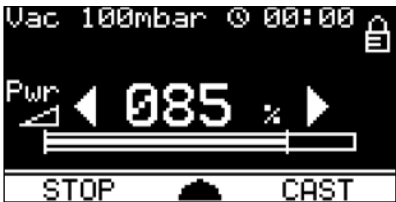
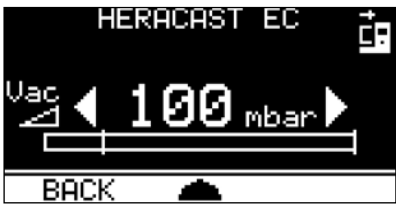
8.3 Setup Menu

The Setup menu includes the following options, which you can select using the turning knob:

- Language (German / English / Japanese).
- Acoustic signals (**ON** / **OFF**).
- Service.

Changed settings must always be saved using the “**SAVE**” key. Unsaved changes will not be applied.

To exit the Service menu push the “**BACK**” key.



8.4 Info Menu

The following information can be viewed in the Info menu:

- Device serial number (S / N).
- Process counter.
- Total operating hours.
- Software (SW) and hardware (HW) version.

Push the “ERROR” to open the error history.

To exit the Info menu push the “BACK” key.



8.5 Error History

In the error history you can browse through the most recent warning and error messages by turning the turning knob. The message currently selected is inverted and contains two lines.

These messages are displayed as follows:

- 1. Line:** Process counter and (Error code → assembly group)
W = Warning message, E = Error message

- 2. Line:** Detailed message description

Inactive messages contain a single line only.

Line: Process counter and (Error code → assembly group)

Push the “TOP” key to jump to the latest message.

To exit the error-history push the “BACK” key.



9 Melting and casting

The technical procedure is described in the following.
For alloy-specific application information, see paragraph 10 Alloys.

9.1 General



NOTE
Please request information brochures on casting according to the Heraeus system.

9.2 Suitable investment materials



NOTE
No graphite-containing investment materials must be used. The graphite content can result in degassing or in damage to the alloy. We recommend to use our graphite-free, phosphate-bonded investment materials.

9.3 Premelting

In order to obtain uniform casting conditions, all alloys are premelted.
The mould is placed into the casting chamber after premelting the alloy.

Exception: Titanium- and aluminium-containing alloys, see paragraph 10.4 Titanium and aluminium containing alloys.



CAUTION
The alloys must be observed continuously during premelting. Generally, each melt may only be observed through the blue glass because of the high luminous intensity. **Risk of getting blinded!** The premelting process may only be interrupted when all the alloy has melted! The alloy has a spherical shape; there are no protruding edges of the molten material. Splitting up of the oxide layer is without any relevance during melting in the graphite crucible.

When melting large quantities (more than 50 g), small individual portions must be premelted. The metal should only be melted so that filling in of the next portion is possible. Only in the last premelt all the alloy is melted.

Exception: CoCr partial denture alloys (see paragraph 10.3 CoCr partial denture and non-precious metal alloys).
Titanium- or aluminium-containing alloys (see paragraph 10.4 Titanium and aluminium-containing alloys).



NOTE
We recommend to do the premelt with 100 % power.

9.4 Casting

After premelting, the casting ring is rapidly placed in the casting chamber and locked in place (ideally approx. 20 – 40 seconds); the chamber is closed and the melting process is started by pressing the key “START”.



NOTE
The interruption between pre- and main melt should not exceed one minute to prevent the melt and the mould from cooling down too much. Each crucible should only be used for one alloy to avoid mixing of alloys. Use a felt pen to mark the crucibles according to the intended use.



NOTE
Power adjustment during melting must be performed manually.

9.4.1 Graphite insert



- NOTE**
- If graphite inserts lose some of their height or the upper border becomes thin and brittle, they must be exchanged → minimum weight of graphite insert approx. 7 g.
 - If a lot of melting powder has accumulated in the graphite insert, no melting powder should be added for the next casting.
 - Prior to each casting blow out graphite insert (cleanliness!)

9.4.2 Ceramic crucibles

When using ceramic crucibles, ceramic bonding and. palladium-based alloys are heated until the oxide layer splits open. When casting CoCr partial denture and NPM alloys, melting is continued until the shadow disappears and, depending on the alloy, casting is performed with or without delay time. When casting titanium- and aluminium-containing alloys, the premelt is sometimes omitted completely and premelt and main melt are carried out in a single working step with the ring being placed in, see paragraph 10.4 Titanium and aluminium-containing alloys.

- The sprues and the casting buttons must be cut into pieces before melting. When filling alloy into the crucible, it must be ensured that the alloy is very close to the bottom of the crucible to achieve optimum melting performance.

10 Alloys



CAUTION
During the melting process it is essential to adhere to/carry out the following instructions.

- Under no circumstances must the machine be left unattended!
- The melt must always be observed!
- The viewing glass must be used for each melting process!
- Risk of getting blinded due to the high luminous intensity of the melt.
- No hot melting crucible must remain in the coil after working.



HOT SURFACE
The casting chamber surface (see symbols on the unit) and the surrounding components are heated up as a result of the process. To avoid the risk of being burned, always wear protective gloves when working.

10.1 Gold casting and high gold content ceramic bonding alloys
Universal and silver palladium alloys

- Alloy quantities:** 5 g to 130 g.
- Gold casting alloys:** Use ceramic crucible with graphite insert.
Add a melting powder pellet (small) after premelting!
- Ceramic bonding:** Use ceramic crucible with graphite insert!
Recommendation: To enable clear analysis of the melting process, add a melting powder pellet (small) after premelting!
- Premelt:** Until all components are completely melted.
Press “STOP” key immediately to end premelt.

Main melt: Manual power regulation.
Observe delay time, when the liquidus temperature is reached again
(see paragraph 13 Recommendations for casting).
Then press “**CAST**” key to start manual casting.

Gold casting alloys and Universal alloys with a liquidus temperature of up to 1070 °C can be cast with 70 % power for main melt.
From a liquidus temperature of 1080 °C (or higher) it is recommended to use full power during the main melt.

10.2 Reduced precious metal ceramic bonding and palladium-based alloys

Processing: Use ceramic crucible.
Recommendation: To enable clear analysis of the casting result, add a melting powder pellet (small) at premelt!

Alloy quantity: 15 g to 100 g (Min. quantity of 20 g for reduced precious metal content bonding alloys).

Premelt: Until the oxide layer splits up.
Press “**STOP**” key to end premelt immediately.

Main melt: 100 % power.
Observe delay time once the oxide layer has split up
(see paragraph 13 Recommendations for casting).
At the end of the time press “**CAST**” key to start manual casting.

10.3 CoCr partial denture and non-precious metal alloys

Processing: Use NPM ceramic crucible without melting powder pellet.

Alloy quantity: 10g to 60g.

Premelt: Until the shadow covers only approx. 1/4 of the last ingot protruding from the surface of the molten mass.
Exception: Heraenium NF.
Until all components are completely melted.
Press “**STOP**” key to end premelt immediately.

Main melt: 100 % power.
Observe delay time after the shadow (see paragraph 13 Recommendations for casting).
Then press „**CAST**“ key to start manual casting.



NOTE
The NPM ceramic crucibles are exclusively suitable for casting NPM alloys and feature a longer lifetime than normal ceramic crucibles. If NPM crucibles are used for precious metal alloys, the silicon might be damaged.

10.4 Titanium and aluminium-containing alloys

Generally, it is possible to cast such alloys in the Heracast EC.
The alloy components titanium and aluminium exhibit a strong tendency towards oxidation on the surface during the melting process which is intensified through the oxygen supply when inserting the ring. The oxide layer may impede or even prevent the alloy from flowing out of crucible. The following measures (working steps) are suitable to reduce the formation of oxide and to support the flowing properties of the metal:

- Increase the preheating temperature of the ring by 50 °C.
- Minimum quantity of alloy: 15 – 20 g.
- Use ceramic crucible type “**C**” (Order No. 66001901).
Programming: Ceramic, NPM; reduce the given vacuum from 250mbar to 50mbar (reduce residual air – eliminate oxide behaviour).
- No premelt.
- The ring is placed and fixed in the holder immediately before starting the main melt and casting processes.
- Melting powder pellet can be added.
- Melt until the casting shadow has disappeared and the melt is moving most strongly. This moment varies with all alloys concerned and must be determined previously!
- As soon as this moment is reached, casting is started by pressing “**CAST**”.

11 Maintenance

Proper function and operational reliability of the unit are only ensured if the required tests, maintenance and service work are performed by Heraeus Kulzer service agents or personnel instructed by Heraeus Kulzer.

Heraeus Kulzer GmbH will not accept any liability for damage – in particular personal injury – resulting from improper maintenance or repair work which has not been performed by Heraeus service agents or adequately trained personnel or if no original spare parts or accessory parts have been used during the exchange of parts.

We recommend to conclude a maintenance contract with our service agents; an offer can be requested there (see paragraph 15 Service).

11.1 Maintenance and care



CAUTION

Prior to maintenance and service work the unit must be switched off and unplugged! Strict adherence to the maintenance intervals is recommended to avoid faulty castings and damage to the unit.

Use mild soap solution (detergent) and an absorbent cloth (moist but not wet!) to clean (moist but not wet!) the outer surface, control elements and washer of the chamber.

Maintenance work types:

– daily

- Check water level.
- Check oil level and remove contaminations (e.g. milky consistency).
- Clean the inside and the outside of the viewing glass using a soft cloth.
- Remove alloy residues, etc. from the collecting plate below the inductor, the chamber, the sliding rails and the washer when the unit is cold (extract or clean with compressed air).
- **In case of moist compressed air:** empty the water extractor of the optional pressure reducer through the release valve on the bottom of the casting machine.

– weekly (or after each 100 castings)

- Clean the inside of the casting chamber, the ring holder, fielding plate and the sealing when the unit has cooled down.

– annually (or after each 3.000 castings)



CAUTION

The following work includes interventions into the unit and may only be performed by adequately trained service personnel!

- Change oil of the vacuum pump.
- Clean oil mist filter of the vacuum pump, if required, exchange them.
- Check casting chamber lock (manual test program).
- Check circulation of cooling water and flow control instrument (manual test program).
If required, change cooling water.
- Change filter for vacuum and compressed air in the valve box.
- Check pressure and vacuum hoses.
- Check activatability of the turning mechanism, wear and firm seat of the gears (manual test program).
- Performance check (manual test run) with graphite crucible.
- Clean filter mat (bottom surface), if required, exchange them.

– after each 10.000 castings or after 3 years

- Check locking bolts, if required, exchange brass case.

11.2 Tests

Works at the electrical equipment of the unit must only be performed by the authorised Heraeus service agents or adequately trained personnel and in the safe condition (voltage cleared). Only approved original spare parts must be used.

11.3 Maintenance

Permissible parts and accessories:
Proper function and operational reliability of the unit are only ensured if approved original spare parts are used.
The use of different parts holds unknown risks and must be absolutely at any rate.

11.4 Disposal

The unit is designed to be operated for 10 years.
For the disposal of spare parts or of the unit in Germany, please contact Heraeus Kulzer GmbH in Hanau, Service department, directly. For all other countries, please contact your appropriate local representation.

11.5 Disposal of old equipment according to WEEE

Electrical and Electronic Equipment Act (ElektroG)
This Act sets out requirements for electrical and electronic equipment according to the 2002/96/EG directive issued by the European Parliament and the European Council of 2005-05-03. Its main purpose is to prevent waste from electrical and electronic equipment and to promote reuse, recycling and other forms of recovery to reduce both the volume of waste for disposal and the inclusion in waste of harmful substances from electrical and electronic equipment.



Consequently, corresponding products from Heraeus Kulzer GmbH will be marked with the symbol below.
For detailed information on professional disposal of disused old devices, contact your dealer or Heraeus Kulzer subsidiary in your country.



IMPORTANT
Marked equipment must not be brought to local waste disposal centers.

12 Technical data

Mains connection	200 – 230 V (± 10%)
Rated frequency	50/60 Hz
Rated power	2.3 kVA
Generator power	1.5 kVA
Fuse type	T 16 A, 250 V
Vacuum pump socket fuse type	T 6.3 A, H 250 V
Compressed air supply	4 – 7 bar
Nominal pressure	3.3 – 3.5 bar
Pressure control valve	3.7 bar
Vacuum	< 100 mbar with vacuum pump CL-P Type 7
Min. cross-section of compressed air supply	Inner 10 mm
Dimensions (w x h x d)	650 x 550 x 450mm
Required table are (w x d)	650 x 550mm
Weight	60 kg
Fuse protection:	For the connection to the mains the electro technical rules and the technical regulations of the local Electricity Board have to be observed. Cut-out fuse 16 A or automatic circuit breaker C16 A.

12.1 Operating conditions

Use	only indoors
Temperature range	5 °C to 40 °C
Relative humidity	80 % to 31 °C 50 % at 40 °C
Installation altitude	up to 2000 m above sea level
Overvoltage category	II
Level of contamination	2
Protection class	1
Protection type	IP 20
Duty cycle (ED)	80 % (intermittent operation)

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12.2 Rating plate


Heraeus Kulzer GmbH
Grüner Weg 11, D-63450 Hanau

2010-01-0010

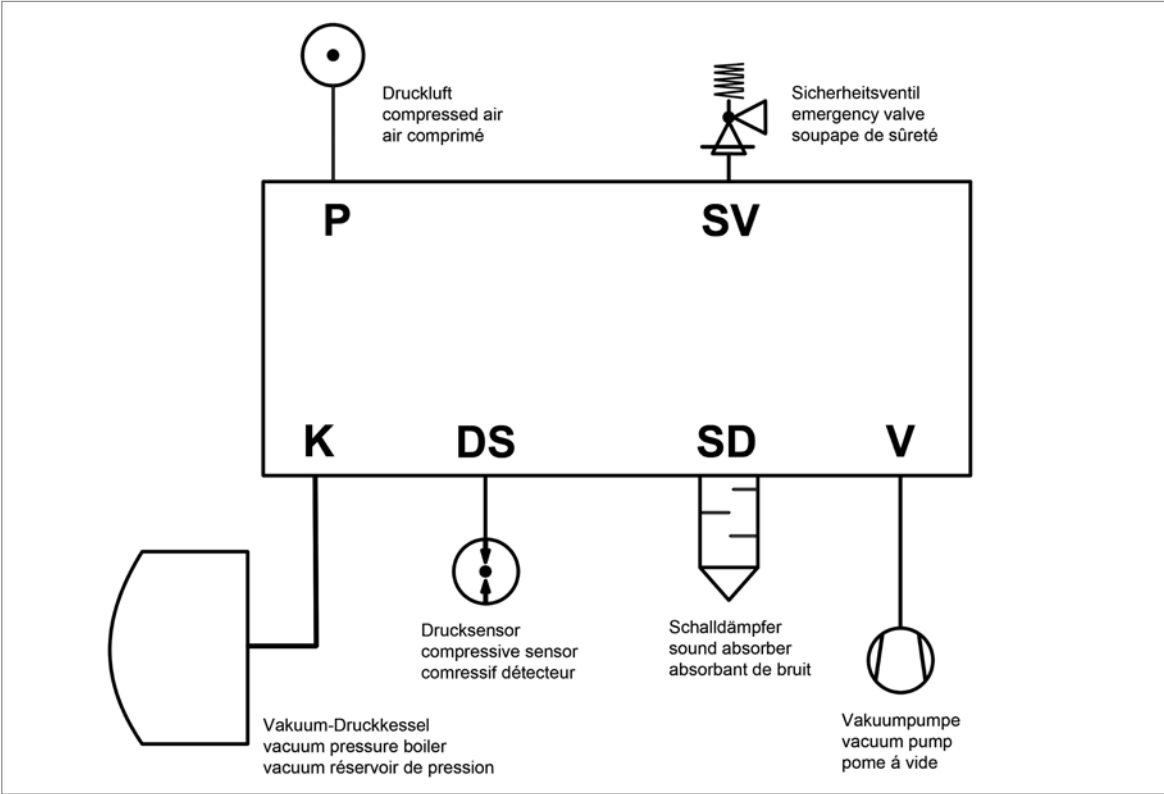
2,3 kVA	200-230V +/- 10%	50/60 Hz
66041213	Heracast EC	80 % ED

**made in Germany**

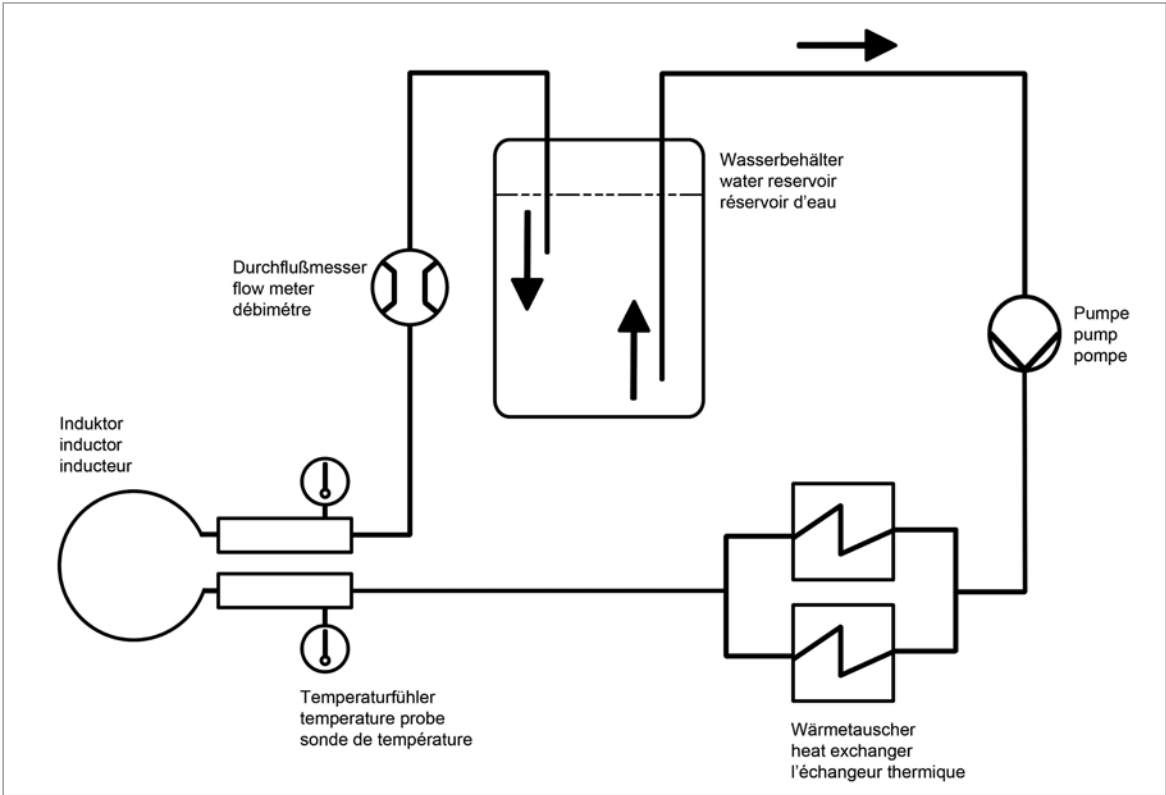
2x T16A250V

2009-4033 / 133 003



12.3 Circuit diagrams compressed air



12.4 Circuit diagrams water circulation



13 Recommendations for casting

Gold casting and Universal alloys	Liquidus temperature	Crucible	Main melt Power	Delay Time
Hera PF	890 °C	Graphite insert	70 %	~ 10 sec.
Hera SG	895 °C	Graphite insert	70 %	~ 10 sec.
Bio Maingold SG, Hera GG	920 °C	Graphite insert	70 %	~ 10 sec.
Maingold SG, Bio Maingold IT	930 °C	Graphite insert	70 %	~ 10 sec.
Maingold MP	960 °C	Graphite insert	70 %	~ 10 sec.
Maingold GV, Maingold Premium	970 °C	Graphite insert	70 %	~ 10 sec.
Mainbond A, OG, Bio Maingold TK	990 °C	Graphite insert	70 %	~ 10 sec.
Mainbond EH	1010 °C	Graphite insert	70 %	~ 10 sec.
Mainbond SUN	1030 °C	Graphite insert	70 %	~ 10 sec.
Bio Maingold I, Bio Heranorm	1035 °C	Graphite insert	70 %	~ 10 sec.
HeranormSun, Hera Ecobond	1040 °C	Graphite insert	70 %	~ 10 sec.
AureaSun, Keramikgold N	1045 °C	Graphite insert	70 %	~ 10 sec.
Keramikgold PF, Herastar	1050 °C	Graphite insert	70 %	~ 10 sec.
Herabest	1060 °C	Graphite insert	70 %	~ 10 sec.
Hera KF	1070 °C	Graphite insert	70 %	~ 10 sec.
AlbaSun	1105 °C	Graphite insert	100 %	~ 10 sec.
Heradent	1165 °C	Graphite insert	100 %	~ 10 sec.

Note: Add a melting powder pellet (small) after premelting!

Operating instructions

Heracast EC

High gold content ceramic bonding alloys	Liquidus temperature	Crucible	Main melt Power	Delay Time
Bio Herador GG, Herador EC	1110°C	Graphite insert	100 %	~ 10 sec.
Herador GG	1125°C	Graphite insert	100 %	~ 10 sec.
Herador C	1135°C	Graphite insert	100 %	~ 10 sec.
Herador S/SG	1150°C	Graphite insert	100 %	~ 10 sec.
Herador PF	1160°C	Graphite insert	100 %	~ 10 sec.
Herador G, Herador H	1200°C	Graphite insert	100 %	~ 10 sec.
Herador NH	1260°C	Graphite insert	100 %	~ 10 sec.
BioCeram Plus	1100°C	Graphite insert	100 %	~ 10 sec.
Bio Herador SG/N	1130°C	Graphite insert	100 %	~ 10 sec.
Herador MP, Bio Herador MP, Bio Herador CN	1140°C	Graphite insert	100 %	~ 10 sec.
Bio SupraCeram	1175°C	Graphite insert	100 %	~ 10 sec.

Recommendation: To enable clear analysis of the melting process, add a melting powder pellet (small) after premelting!

Pd-based alloys and Gold-Pd alloys	Crucible	Main melt Power	Delay time after oxide layer splits up
Albabond/E/EH/A/B/C	Ceramic	100 %	6
Heralight	Ceramic	100 %	6
Albaloy	Ceramic	100 %	6
Herabond/N	Ceramic	100 %	6
Heraloy G/U	Ceramic	100 %	6

Recommendation: For clear analysis of the melting process, (when premelting) add a melting powder pellet (small)!

NPM / CoCr partial denture alloys	Crucible	Main melt Power	Delay time after the shadow
Heraenium CE	Ceramic	100 %	0
Heraenium EH	Ceramic	100 %	3
Heraenium Laser	Ceramic	100 %	3
Heraenium P	Ceramic	100 %	8
Heraenium Pw	Ceramic	100 %	6
Heraenium Sun	Ceramic	100 %	4–6
Heraenium NF *	Ceramic	100 %	6

* Until all components are completely melted.

14 Control information

Putting unit into operation			
Check compressed air supply, if required open	Switch on main switch	Self test	Unit is ready for casting

Gold casting and Universal alloys	High gold content ceramic bonding alloys	Pd-based alloys and Gold-Pd alloys	NPM / CoCr partial denture alloys
Select menu graphite crucible	Menu options Graphite crucible	Menu options Ceramic crucible	Menu options NPM
Check vacuum and change if required (recommendation approx. 100 mbar)	Check vacuum and change if required (recommendation approx. 100 mbar)	Check vacuum and change if required (recommendation approx. 100 mbar)	Check vacuum and change if required (recommendation approx. 250 mbar)
Place ceramic crucible with graphite insert in the coil	Place ceramic crucible with graphite insert in the coil	Place ceramic crucible in coil	Place ceramic crucible in coil
Adjust ring size and height	Adjust ring size and height	Adjust ring size and height	Adjust ring size and height
Add metal in small pieces into the crucible	Add metal in small pieces into the crucible	Add metal in small pieces into the crucible. Recommendation: For clear analysis of the melting process (when premelting), add a melting powder pellet (small)!	Ensure horizontal, parallel placing of metal cylinders
Close chamber	Close chamber	Close chamber	Close chamber
Premelt; press “ START ”, power 100 %	Premelt; press “ START ”, power 100 %	Premelt; press “ START ”, power 100 %	Premelt; press “ START ”, power 100 %
Observe melt, interrupt premelt with “ STOP ” button after the alloy has completely melted	Observe melt, interrupt premelt with “ STOP ” button after the alloy has completely melted	Observe melt, after splitting up of the oxide layer interrupt premelt with “ STOP ” button	Observe melt, depending on alloy type interrupt premelt with “ STOP ” button
Open casting chamber and add melting powder pellet	Open casting chamber Recommendation: For clear analysis of the melting process, (after premelting), add a melting powder pellet (small)!	Open casting chamber	Open casting chamber (no melting pellet!)
Place ring in chamber and lock in place, close chamber	Place ring in chamber and lock in place, close chamber	Place ring in chamber and lock in place, close chamber	Place ring in chamber and lock in place, close chamber
Observe main melt and readjust power if required (see paragraph 13 Recommendations for casting). At the end of the time, turn inductor manually. “ CAST ” key	Observe main melt (see paragraph 13 Recommendations for casting) and at the end of the time turn inductor manually. “ CAST ” key	Observe main melt; start timer after oxide layer has split up (see paragraph 13 Recommendations for casting). At the end of the time, turn inductor manually. “ CAST ” key	Observe main melt; start timer after the shadow (see paragraph 13 Recommendations for casting). At the end of the time, turn inductor manually. “ CAST ” key
After approx. 60 sec. the induction coil and casting ring is turned back; open chamber and remove casting ring	After approx. 60 sec. the induction coil and casting ring is turned back; open chamber and remove casting ring	After approx. 60 sec. the induction coil and casting ring is turned back; open chamber and remove casting ring	After approx. 60 sec. the induction coil and casting ring is turned back; open chamber and remove casting ring

Putting unit out of operation		
Remove crucible after casting	The unit can be switched off after 5 minutes cool down	If required, turn off compressed air supply

15 Service

15.1 Service agents / Contact in the countries

LAND / COUNTRY	NAME / ADDRESS
Australien / Australia	Heraeus Dental Australia Pty Ltd, Rydecorp, Unit 6, 2 Eden Park Drive, Macquarie Park NSW Australia 2113 Tel. / Phone +61 2-8422 6100, Fax +61 2-9888 1460
Brasilien / Brazil (America Sul / America del Sur / South America)	Heraeus Kulzer South America Ltda., CNPJ 48.708.010/0001-02, Rua Cenno Sbrighi, 27 – cj. 42, São Paulo – SP 05036-010 Tel. / Phone +55 11 3665-0506, Fax +55 11 3665-0521
China / China Shanghai	Heraeus Kulzer Dental Trading Co. Ltd., 1585 Gu Mei Road, 200233 Shanghai Tel. / Phone +86 21 64 95 84 88, Fax +86 21 64 95 17 32
Frankreich / France	Heraeus S.A.S., Parc Silic – Bat.i.2, Villebon – BP 630, 12, Avenue du Québec, 91945 Courtaboeuf Cédex Tel. / Phone +33 169 18 48 85, Fax +33 169 28 78 22
Großbritannien / United Kingdom	Heraeus Kulzer Ltd., Heraeus House, Albert Road / Northbrook Street, RG14 1DL Newbury, Berkshire Tel. / Phone +44 163 53 05 00, Fax +44 163 53 06 06
Italien / Italy	Heraeus Kulzer S.r.l., Via Console Flaminio 5/7, 20134 Milano Tel. / Phone +39 022 10 09 41, Fax +39 022 10 09 42 83
Japan / Japan	Heraeus Kulzer Japan Co. Ltd., 2F TSK Bldg., 8-13 Hongo 4-chome, Bunkyo-ku, 113-0033 Tokyo Tel. / Phone +81 358 03 21 53, Fax +81 358 03 21 50
Mexiko / Mexico	Heraeus Kulzer Mexico S.A. de C.V., Homero 527 – 301 y 302, Col. Pol., 11560 Mexico, D. F. Tel. / Phone +52 55 31 55 49, Fax +52 55 52 55 16 51
Niederlande / The Netherlands	Heraeus Kulzer Benelux B.V., Fustweg 5, 2031 CJ Haarlem Tel. / Phone +31 235 43 42 50, Fax +31 235 43 42 55
Nordamerika / North America	Heraeus Kulzer, LLC, 300 Heraeus Way, South Bend, IN 46614-2517 Tel. / Phone 1 57 42 99 54 10, Fax 1 57 42 99 66 31
Österreich, Schweiz / Austria, Switzerland	Heraeus Kulzer Austria GmbH, Nordbahnstraße 36 / Stg 2/4/4.5, A-1020 Wien Tel. / Phone +43 (0) 14 08 09 41, Fax +43 (0) 14 08 09 41 70
Singapur / Singapore	Heraeus Dental, Heraeus Materials Singap. Pte.Ltd., #07-01 TechPlace II, 569881 Singapore Tel. / Phone +65 65 71 75 69, Fax +65 65 71 75 77
Skandinavien / Scandinavia	Heraeus Kulzer Nordic AB, Hammarbacken 4B, 19149 SOLLENTUNA Tel. / Phone +46 8 58 57 77 55, Fax +46 86 23 14 13
Spanien / Spain	Heraeus S.A., C/ Forjadores, 16 (Prado del Espino), 28660 Boadilla – Madrid Tel. / Phone +34 913 58 03 75, Fax +34 913 58 03 68
Ungarn / Hungary	Heraeus Kulzer Hungary Kft., Stefania ut 101-103, 1143 Budapest Tel. / Phone +36 17 88 42 22, Fax +36 17 88 42 33

16 Document history

- 2010-03 First release.
- 2011-04 Editorial modifications technical data.
Complete Service agents and update contacts in the countries.
- 2013-10 Text editing. Adding paragraph 7.4.

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